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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/788,587	02/21/2001	Dug Jin Park	8733.389.00	8760

30827 7590 02/11/2005

MCKENNA LONG & ALDRIDGE LLP
1900 K STREET, NW
WASHINGTON, DC 20006

EXAMINER	
QI, ZHI QIANG	

ART UNIT	PAPER NUMBER
2871	

DATE MAILED: 02/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/788,587	PARK ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5,6,9,11,12 and 14-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5,6,9,11,12 and 14-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 14, 9, 11-12 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art (AAPA) in view of US 6,022,753 (Park et al), US 6,077,643 (kumar et al) and US 5,907,008 (Nakano et al).

Claims 14, 9 and 11-12, AAPA discloses (paragraph 0005 – paragraph 0015; Figs.1A – 1E) that a method of fabricating a liquid crystal display device having a thin film transistor with a gate electrode (13), a gate insulating film (15), an active layer (17), an ohmic contact layer (19), and source electrode (21), drain electrode (22) on a transparent substrate (11) (or forming a thin film transistor having a gate electrode 13, a source electrode 21, and a drain electrode 22 on a transparent substrate 11), and the gate line connected to the gate electrode, the data line (23) connected to the source electrode (21) that define a pixel area; and the method comprising the steps of:

- forming a passivation layer (25) covering the thin film transistor, the gate line and the date line on the transparent substrate (11); and patterning the passivation layer (25) to define a contact hole (26) for exposing the drain electrode (22);

- forming a transparent conductive film (27) being in contact with the drain electrode (22) via the contact hole (26) on the passivation layer (25);
- the exposing step is the ultraviolet ray selectively irradiated onto the photoresist (29) using an exposure mask (31) having a shielding part (32) (opaque part) and a transparent part (33) (page 4, lines 14-20; Figs.1D-1E), i.e., using an exposure mask to expose the photoresist by the light passing through the transparent part of the exposure mask.

AAPA does not expressly disclose that coating a negative-type photoresist on the transparent conductive film and then exposing the negative-type photoresist with an image of pixel electrode, other than a portion corresponding to data line, gate line and TFT area; and developing the photoresist such that the unexposed area is removed; patterning the transparent conductive film using the photoresist pattern as a mask to form a pixel electrode in contact with the drain electrode via the contact hole; and soft-baked photoresist coating into a thickness of 1-2 μm and at temperature of 120-150°C, and post exposure baking at temperature of 125-145°C.

However, Park discloses (col.4, line 22 – col. 5, line 30; Figs. 5A – 5D and 6A – 6D) that a manufacturing method of forming a pixel electrode by using a negative photoresist and by a front exposure in which the photoresist (1000) is formed on the transparent conductive layer (ITO) (800), so that the negative photoresist remains when exposed by light, such that the light is irradiated from the front side of the substrate (100) is executed by using a mask having opening pattern over portions of the negative photoresist (1000) on the pixel region (P), and then the exposed portions remains after

development, and the ITO layer (800) is etched by using the remaining photoresist as an etch mask to form a pixel electrode (810).

Park also discloses (col.5, lines 31-34) that in the manufacturing method, the pixel electrode (810) overlaps the gate line (200), the gate electrode (210) and data line (600), but the pixel electrode (810) may not overlap them. The fundamental principle is the same as using negative photoresist coating and exposing to light would remove the unexposed portions.

Park indicates (col.5, lines 16-30) that forming the pixel electrode (810) by using the negative photoresist, the pixel defects decreased compared with using a positive photoresist through the front exposure, because if there exist some particles on the unexposed portions of the negative photoresist to light which would cause the adjacent pixel electrodes electrically shorted would be removed (the unexposed portions of the negative photoresist to light is removed).

Therefore, it would have been obvious to those skilled in the art to use negative photo resist for deceasing the adjacent pixel electrode electrically short defects.

Still lacking limitation is such that the soft-baked photoresist coating into a thickness of 1-2 μm and at temperature of 120-150°C, and post exposure baking at temperature of 125-145°C.

However, Kumar discloses (col.12, lines 65 – 68) that the photoresist composition is softbaked at 120 °C. Kumar discloses (col.11, lines 66-67) that the photoresis coated to an thickness 7320 Å (0.73 μm) that is close to the thickness of 1.0 μm. Kumar discloses (col.12, line 67 – col.13, line 14) that the resist coating layer after

exposure to the light would be post-exposure baked (PEB) at temperature range 110 - 140°C to obtain a certain dissolution rate.

Concerning the photoresist is coated into a thickness of 1.0 to 2.0 μm, Nakano discloses (col.26, lines 14-27; Fig.4B) that the thickness of the negative photoresist film (19) is 1.0 μm.

In the case where the claimed ranges "overlap or lie inside ranges discloses by the prior art" a prima facie case of obviousness exists. (See MPEP 2144.05 I) This is the case, and the obviousness exists.

The photoresist is a kind of actinic resin, so that coating the photoresist must have a certain thickness and in order to make adhesive the coating that must be hardening and first must be softbaked at a certain temperature, and those skilled in the art would find a proper thickness, such as 1.0 – 2.0 μm and a proper softbaking temperature such as 120 – 150°C, and that would have been at least obvious.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to coat a negative-type photoresist on the transparent conductive film and forming an exposed area defining a pixel area, then exposing the negative-type photoresist with an image of a pixel electrode, then developing the photoresist in which the unexposed area is removed, then patterning the transparent conductive film using the photoresist as a mask to form a pixel electrode in contact with the drain electrode via the contact hole, then remove the photoresist pattern as claimed in claims 14, 9 and 11-12. Since coating a negative-type photoresist and exposing by light and then soft-

baking, post baking would harden the coating and obtaining a certain dissolution rate, and that would decrease the adjacent pixel electrodes electrically shorted defects.

Claim 15, AAPA discloses (paragraph 0015; Figs.1D-1E) that patterning the transparent conductive film (27) uses a mixed acid as an etchant liquid, and that is using a wet etchant.

Claim 16, AAPA (paragraph 0015; Fig.1D-1E) that the photoresist (29) is developed with a developer, such as aqueous alkali solution.

Claims 17-18, AAPA discloses (paragraph 0013; Figs.1D-1E) that the passivation layer (25) is patterned to define a control hole (26) so as to expose the drain electrode (22), and the transparent conductive material (ITO) is deposited on the passivation layer (25) so as to electrically contact the drain electrode (22) via the contact hole (26).

3. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA, Park, kumar and Nakano as applied to claims 14, 9, 11-12 and 15-18 above, and further in view of US 6,159,654 (Machida et al).

Claim 5, Kumar (col.12, lines 65 – 68) that the photoresist composition is softbaked at 120 °C that is overlap range as the range claimed such as sofebaked at 100 –125 °C.

Lacking limitation is such that the development is conducted by an aqueous alkali solution for 60 to 120 seconds.

However, Machida discloses (col.30 lines 31-49) that the resin layer (photo resist is a photosensitive resin) was dipped into the aqueous alkali solution type developing solution for 60 seconds (i.e., the range overlaps the range of 60 to 120 second), as a

result a negative pattern excellent in clearness. In the case where the claimed ranges "overlap the ranges disclosed by the prior art" a prima facie case of obviousness exists (See MPEP 2144.05.I.).

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to conduct the development by an aqueous alkali solution for 60 to 120 second as claimed in claim 5 for obtaining an excellent clearness.

Claim 6, Park discloses (col.5, lines 1-15; Fig.6) that the light exposure is executed by using a mask (exposure mask) having opening pattern (the exposure part) over the portions of the negative photoresist (1000) on the pixel region (P) (Fig.6A) (corresponding to the pixel area), so that the shielding part of the exposure mask would corresponding to the data line, gate line and the thin film transistor area (Fig.6A), such that the unexposed portions of the negative photoresist to light would be removed, so as to prevent the adjacent pixel shorting defects.

Therefore, it would have been obvious to those skilled in the art to use the exposure mask as claimed in claim 6 for removing the unexposed portions of the negative photoresist, so as to prevent the adjacent pixel shorting defects.

Response to Arguments

4. Applicant's arguments filed on Dec.10, 2004 have been fully considered but they are not persuasive.

Applicant's arguments are as follows:

1) None of the references teaches or suggests the claimed feature of "the photoresist is coated into a thickness of 1.0 to 2.0 μm

Examiner's responses to Applicant's arguments are as follows:

1) The prior art of record such as the reference Nakano discloses (col.26, lines 14-27; Fig.4B) that the thickness of the negative photoresist film (19) is 1.0 μm.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1) US 6,410,209 (Adams et al) discloses (col.1, lines 16-18; col.24, lines 17-39) that the photoresists are photosensitive films, and the film was developed using an industry-standard 60 seconds. Therefore, the development is conducted for 60 second that is an industry-standard, and that would have been at least obvious.

2) US 5,453,659 (Wallace et al) discloses (col.9, line 61 – col.10, line 24) that typically, an average thickness of the negative photoresit layer is approximately 1000 nm (1.0 μm).

3) US 6,184,964 (Kameyama et al) discloses (col.7, lines 52-65) that using 2 μm-thick layer of a photoresist and followed by exposure to light with a mask having a prescribed pattern.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (571) 272-2299. The examiner can normally be reached on M-T 8:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mike Qi

Mike Qi
Patent Examiner